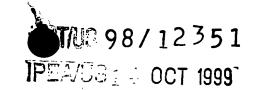
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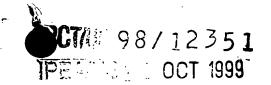


What is claimed is:

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- 1. A synthetic oligonucleotide comprising a C-5 methylcytosine and which recognizes and binds an allosteric site on DNA cytosine methyltransferase (DCMTase) thereby modulating DCMTase activity associated with the allosteric site.
- 2. The synthetic oligonucle of claim 1, wherein the modulating comprises inhibition.
- 3. The synthetic oligonucleotide of claim 1, wherein the modulating comprises activation.
- 10 4. The synthetic oligonucleotide of claim 1, wherein the C-5 methylcytosine is present as a 5mCpG dinucleotide.
 - 5. The synthetic oligonucleotide of claim 1, wherein the DCMTase is from a mammal, bird, fish, amphibian, reptile, insect, plant or fungus.
- 6. The synthetic oligonucleotide of claim 5, wherein the mammal is selected from the group consisting of mouse and human.
 - 7. The synthetic oligonucleotide of claim 1 having an inhibition constant of not greater than 1000 nM.
 - 8. The synthetic oligonucleotide of claim having an inhibition constant of not greater than 200 nM.
- 20 9. The synthetic oligonucleotide of claim 8 having an inhibition constant of not greater than 20 nM.
 - 10. The synthetic oligonucleotide of claim 1 comprising a nucleotide sequence as shown in Figure 1B and designated GC-box b^{MET} (SEQ ID NO:10), GC-box p^{MET} (SEQ ID NO:13), GC-box d^{MET} (SEQ ID NO:14), GC-box e^{MET} (SEQ ID NO:15), or CRE a^{MET} (SEQ ID NO:11).
 - 11. A method of inhibiting methylation of DNA comprising contacting a DCMTase with a synthetic inhibitor molecule so as to form an enzyme/synthetic inhibitor molecule complex in the presence of the DNA, wherein the synthetic inhibitor

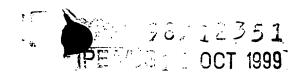




12.

molecule comprises a C-5 methylcytosine which recognizes and binds an allosteric site on DCMTase, thereby inhibiting DNA methyltransferase activity.

- A method of inhibiting proliferation of cancer cells comprising administering to a subject a synthetic inhibitor molecule which recognizes and binds an allosteric site on DCMTase thereby resulting in an enzyme/synthetic inhibitor molecule complex, the presence of the complex inhibiting DCMTase-mediated methylation of DNA, thereby inhibiting proliferation of the cancer cells.
- 13. The method of claim 12, wherein the cancer cell is from lung, breast, prostate, pancreas or colon.
- 10 14. The method of claim 11) wherein the synthetic inhibitor molecule is an oligonucleotide of any one of claims 1-10.
 - 15. The method of claim 12 or 13, wherein the subject is a human.
 - 16. The method of claim 12 or 13 wherein the subject is an animal.
- 17. The method of claim 16, wherein the animal is porcine, piscine, avian, feline, equine, bovine, ovine, caprine or canine.
 - 18. A method of identifying a molecule which recognizes and binds an allosteric site on DCMTase comprising:
 - (a) contacting a molecule with DCMTase in the presence of DNA and AdoMet;
- 20 (b) measuring DCMTase activity, an increase or decrease in DCMTase activity being indicative of a modulator of DCMTase; and
 - (c) determining whether the modulation of DCMTase activity is via binding an allosteric site on DCMTase.
 - 19. The method of claim 18, wherein the modulator is an inhibitor.
- 25 20. The method of claim 18, wherein DCMTase activity is measured using a steady-state assay.



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The method of claim 12, wherein the synthetic inhibitor molecule comprises a C-5 methylcytosine.

- 22. The method of claim 12, wherein the synthetic inhibitor molecule is an oligonucleotide of any one of claims 1-10.
- 5 23. The method of claim 14, wherein the subject is a human.
 - 24. The method of claim 14, wherein the subject is an animal.
 - 25. The method of claim 24, wherein the animal is porcine, piscine, avian, feline, equine, bovine, ovine, caprine or canine.

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